Climate Change and Human Health Literature Portal

National Institute of Environmental Health Sciences

A model of malaria epidemiology involving weather, exposure and transmission applied to north East India

Author(s):	Goswami P, Murty US, Mutheneni SR, Kukkuthady A, Krishnan ST
Year:	2012
Journal:	PLoS One. 7 (11): e49713

Abstract:

BACKGROUND: Quantitative relations between weather variables and malaria vector can enable pro-active control through meteorological monitoring. Such relations are also critical for reliable projections in a changing climate, especially since the vector abundance depends on a combination of weather variables, each in a given range. Further, such models need to be region-specific as vector population and exposure depend on regional characteristics. METHODS: We consider days of genesis based on daily temperature, rainfall and humidity in given ranges. We define a single model parameter based on estimates of exposure and transmission to calibrate the model; the model is applied to 12 districts of Arunachal Pradesh, a region endemic to malaria. The epidemiological data is taken as blood samples that test positive. The meteorological data is adopted from NCEP daily Reanalysis on a global grid; population data is used to estimate exposure and transmission coefficients. RESULTS: The observed annual cycles (2006-2010) and the interannual variability (2002-2010) of epidemiology are well simulated for each of the 12 districts by the model. While no single weather variable like temperature can reproduce the observed epidemiology, a combination of temperature, rainfall and humidity provides an accurate description of the annual cycle as well as the inter annual variability over all the 12 districts. CONCLUSION: Inclusion of the three meteorological variables, along with the expressions for exposure and transmission, can quite accurately represent observed epidemiology over multiple locations and different years. The model is potentially useful for outbreak forecasts at short time scales through high resolution weather monitoring; however, validation with longer and independent epidemiological data is required for more robust estimation of realizable skill. While the model has been examined over a specific region, the basic algorithm is easily applicable to other regions; the model can account for shifting vulnerability due to regional climate change.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3507888

Resource Description

Exposure : ⊠

weather or climate related pathway by which climate change affects health

 Meteorological Factors, Precipitation, Temperature

   Temperature: Fluctuations

Geographic Feature: ⊠

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☒

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: India

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content